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Nascent entrepreneurship and the level of economic development

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ABSTRACT

Based upon two strands of literature, this paper hypothesizes a U-shaped relationship between a country's rate of entrepreneurial dynamics and its level of economic development. This would imply a different scope for entrepreneurship policy across subsequent stages of development. Regressing GEM's 2002 data for nascent entrepreneurship in 36 countries on the level of economic development as measured either by per capita income or by an index for innovative capacity, we find support for a U-shaped relationship. Testing our results against several control variables, evidence is again found for this relationship with economic development, in addition to significant effects of the business ownership rate (+), social security expenditure (-), aggregate taxes (+) and population growth (+). The results suggest that a 'natural rate' of nascent entrepreneurship is to some extent governed by 'laws' related to the level of economic development. For the most advanced nations, improving incentive structures for business start-ups and promoting the commercial exploitation of scientific findings offer the most promising approach for public policy. Developing nations, however, may be better off pursuing the exploitation of scale economies, fostering foreign direct investment and promoting management education.

JEL-CODES: J23, L16, M13, O11

KEYWORDS: Nascent entrepreneurship, economic development

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INTRODUCTION

It has long been known that the *level* of entrepreneurship, expressed as the percentage of owner/managers of incorporated and unincorporated businesses relative to the labor force, differs strongly across countries. This variance is related to differences in levels of economic development, but also has to do with diverging demographic, cultural and institutional characteristics (Blanchflower, 2000). In particular, evidence has been assembled for an underlying U-shaped relationship between the level of business ownership (self-employment) and per capita income (Blau, 1987; Acs et al., 1994; Carree et al., 2002). Recent research in the framework of the Global Entrepreneurship Monitor (GEM) has brought to light that the *dynamics* of entrepreneurship, expressed as the rate of nascent entrepreneurship or the prevalence of young enterprises, also show a wide-ranging diversity across nations. An explanation of this variance is much needed as many governments attach high hopes to a positive effect of entrepreneurship on economic well-being and accordingly try to promote new business start-ups. It is particularly important to know the extent to which a country's level of economic development may determine a 'natural rate' of entrepreneurial dynamics and may thus constrain the scope for entrepreneurship policy. In this paper it is conjectured that, analogous to the level of entrepreneurship, a U-shaped relationship with economic development is also likely for the rate of entrepreneurial dynamics. This means that, as a nation develops economically, its prevalence of nascent entrepreneurship and of new business start-ups is likely to decline until a revival occurs at the high end of economic development. The purpose of this paper is to investigate the arguments supporting this conjecture and to test it empirically. To our knowledge, no analysis of the relationship between the level of economic development and the gross inflow into entrepreneurship (self-employment) has ever been carried out. The existence of a 'natural rate' of entrepreneurial dynamics depending upon the level of economic development would imply that this level has to be taken into account to decide whether entrepreneurial dynamics are low or high.

Two strands of literature will be used to propose a model for explaining the diversity in nascent entrepreneurship across nations with wide-ranging levels of economic development. The first literature deals with economic development and its main accompanying processes, while the second relates a country's level of economic development to its rate of

entrepreneurship. We estimate the model using data from the Global Entrepreneurship Monitor 2002 for 36 countries. The rate of nascent entrepreneurship is defined as the number of people actively involved in attempting to start a new business, expressed as a percentage of the adult population. Economic development is defined either as per capita income or as innovative capacity.

The present paper is organized as follows. In the first section we discuss the relevant literature and state our hypothesis. In the subsequent section we elaborate the research method and the main data used to test our hypothesis. Next, we introduce the control variables. Subsequently, we present the results of our regressions. A final section presents our conclusions.

LITERATURE REVIEW

Economic development

There are many concepts of economic development. A well-known operational notion of economic development focuses on the accompanying, interrelated processes of structural change, and is referred to as structural transformation (Syrquin, 1988: 206). Accumulation of physical and human capital, and shifts in the sector composition of economic activity (production, employment, consumption) are regarded as the core components of this transformation. Related socio-economic changes are urbanization, demographic transitions, a growing level of education and changes in the distribution of income. In economic history, one tradition distinguishes between ‘stages of economic development’, thus emphasizing discontinuities in development. A well-known example is Rostow’s theory (1960), that hypothesizes five stages of economic growth. Major criticisms of this theory have to do with the notion of a unique path of development. More recently, Chenery and Syrquin (as cited by Syrquin, 1988: 244, 245) identified three stages of transformation: primary production, industrialization and the developed economy. A further distinction also takes account of the population size of countries and of patterns of international specialization.

In a modern view of economic development, as propagated by Porter, Sachs and McArthur (2002), economic development means increasingly sophisticated ways of producing and competing, and implies the evolution from a resource-based to a knowledge-based economy. These authors distinguish between three stages and two transitions. At the lowest levels of economic development, production is based upon the mobilization of primary factors of production: land, primary commodities and unskilled labor. At this *factor-driven stage*, international competitiveness is primarily based upon low factor costs and/or the presence of minerals and other commodities. As countries move to the second stage, i.e. that of industrialization, economic growth becomes more capital intensive and thus *investment-driven*. For a successful transition to this stage and its related middle-income status, countries must subsequently get their labor and capital markets working more properly, attract foreign direct investment and educate their workforce to be able to adopt technologies developed elsewhere. Competitiveness is primarily based upon high rates of production efficiency in manufacturing. The key processes in moving from the first to the second stage are capital accumulation and technological diffusion. These may enable countries to achieve a certain degree of 'catch-up growth'. A third stage is that of a technology generating economy (*innovation-driven stage*). According to Porter et al. (2002: 17), countries that have reached this stage innovate at the global technological frontier in at least some sectors. This stage also implies a high-income status. The transition to this stage requires a country to develop its ability to generate as well as commercialize new knowledge. This entails intensive cooperation between universities, private businesses and government. Once a critical mass of knowledge, technologies, skills and purchasing power has been built up, innovation may achieve increasing returns to scale. These will fuel a self-perpetuating process of continuing innovation and long-term economic growth (Sachs, 2000). At this point one may speak of a knowledge economy. Audretsch and Thurik (2001 and 2004) describe this transition as one from the 'managed' to the 'entrepreneurial' economy.

Economic development and (occupational) entrepreneurship

Definitions of entrepreneurship abound. Hébert and Link (1989) list twelve different concepts of entrepreneurship that have one time or another been proposed by economists. Most of these concepts pertain to the social and economic functions of entrepreneurship. Other

notions have to do with either an occupational or a behavioral view of entrepreneurship (Wennekers, 2005). In the present paper we follow the occupational view. Synonyms for entrepreneurs in this sense are business owners, proprietors and self-employed. Subsequently, a distinction may be made between a *static* and a *dynamic* perspective of entrepreneurship. The static perspective views the number of business owners (or the business ownership rate) as a dimension of the industrial structure of the economy. The dynamic perspective refers to gross and net changes in the rate of business ownership.

Several authors, including Kuznets (1971), Schultz (1990), Yamada (1996) and Iyigun and Owen (1998) have reported a negative empirical relationship between the level of economic development and the rate of business ownership (self-employment) in the labor force. Their studies use large cross-sections of countries spanning a wide range of economic development. Likewise, time series data for several of the most highly developed economies show a declining trend in self-employment for at least the first three quarters of the 20th century (Wennekers and Folkeringa, 2002). There are various reasons for the historical decline of self-employment with increasing per capita income. Across different levels of economic development, a shift from agriculture to manufacturing implies economies of scale in production, while larger enterprises in many sectors may also offer better opportunities to minimize transaction costs. Additionally, Lucas (1978) assumes an unequal distribution of "managerial" talent among the working population. He shows how rising real wages increase the opportunity cost of self-employment relative to the return, inducing marginal entrepreneurs to become employees. Iyigun and Owen (1998) assume a distribution of risk aversion. They argue that with rising economic development fewer individuals are willing to run the risk associated with becoming an entrepreneur as the relatively "safe" professional earnings rise.

In recent decades, statistical evidence indicates a *reversal* of the negative relationship between real income and self-employment occurring at an advanced level of economic development. Blau (1987) was among the first to analyze this reversal for the US, using time series data for the period 1948-1982. Acs, Audretsch and Evans (1994) point out a clearly U-shaped trend in the total self-employment rate for 12 OECD countries between 1966 and 1990. They also establish a U-shaped pattern for several individual countries. There are

several reasons for this recent revival of self-employment. From a certain level of economic development onwards, the employment share of manufacturing starts declining while that of the services sector keeps increasing with rising per capita income, providing more opportunities for business ownership.[1] Also, at high levels of economic development, increasing income and wealth enhance consumer demand for variety (Jackson 1984) creating new market niches attainable for small businesses. On the supply side of entrepreneurship, as hypothesized in social psychology, there is a hierarchy of human motivations, ranging from physical needs at the bottom to self-realization at the top (Maslow 1970). Once the main material needs have been satisfied, a still higher level of prosperity will give prominence to immaterial needs such as a growing need for self-realization. Because it provides more autonomy (in the multi-dimensional sense of 'independent self determination')[2], entrepreneurship may then become more highly valued as an occupational choice than at lower income levels. Carree et al. (2002) summarize these arguments and hypothesize a U-shaped relationship between the level of per capita income and the rate of self-employment (business ownership) in the labor force. In a multiple-equation regression analysis, using data for 23 OECD countries in the period 1976-1996, they find empirical support for this hypothesis.

Do the above arguments with respect to the self-employment level also apply with respect to the gross inflow into self-employment? To some extent this will hold almost by definition as the start-up rate is positively related to the level of business ownership through several mechanisms on the demand side and the supply side of entrepreneurship. First, given a life cycle for enterprises, a high business ownership rate will *ceteris paribus* imply a high level of business closures and subsequent replacement start-ups, while a low business ownership rate implies a narrow scope for replacement. Secondly, the business ownership rate also affects the opportunities for the displacement of incumbent enterprises. Thirdly, on the supply side of entrepreneurship, the incumbent business ownership rate governs the availability of entrepreneurial role models stimulating other members of a population to become an entrepreneur. Accordingly, one may expect a U-shaped relationship between economic

[1] This effect may be temporary in the case of future up-scaling of average firm size in new services.
[2] See Van Gelderen et al. (2003) for an exposition of the 'multiple sources of autonomy as a startup motive'.

development on the one hand and nascent entrepreneurship and new business start-ups on the other, similar to the curvilinear correspondence between economic development and the level of business ownership. In addition, there are also specific reasons why a revival of the gross inflow into entrepreneurship at the high end of economic development would take place at the present time. Several studies argue that in the last 25 years, innovative advantage has moved from large, established corporations to small and new enterprises, because new information and communication technologies (ICT) have reduced the importance of scale economies in many sectors. Also, the present ICT revolution (sometimes called the 'Third Industrial Revolution') and the related process of globalization have led to an increasing degree of uncertainty in the world economy from the 1970s onwards (Audretsch and Thurik, 2001; Thurow, 2003). This economic uncertainty, in turn, has also created more room and more need for new business startups as agents of change, trying to exploit new ideas[3]. Two regimes may be distinguished (Carree et al., 2002). In the Schumpeter Mark I regime ('creative destruction') new entrepreneurs challenge incumbent firms by introducing new inventions. In the Schumpeter Mark II regime ('creative accumulation') R&D activities of established corporations determine the rate of innovation. Industries in the latter regime develop a concentrated market structure, while industries in the former regime offer more opportunities to small businesses and to new entrepreneurial ventures. The greater role in technological development, in recent decades, for new business startups at the cost of large incumbent firms may be interpreted as a 'Schumpeterian regime switch' from the Schumpeter Mark II regime of the 1930-1970 era, back to a Schumpeter Mark I regime as prominent during the Second Industrial Revolution (1860 through the early 1900s)[4]. It is also indicated as a switch from a 'managed' towards an 'entrepreneurial' economy (Audretsch and Thurik, 2001). Clearly, for countries at the innovation-driven (high end) stage of economic development, the start-up of new enterprises is a crucial process (Porter et al., 2002: 18, 19; Thurow, 2003: 95).

Summing up, we hypothesize a U-shaped relationship between a country's gross inflow into entrepreneurship and its level of economic development.

[3] "To get a few big success stories, millions of start-ups are necessary" (Thurow, 2003: 95).

[4] These regimes are strikingly symbolized by the fact that, in the US, more than 2,000 car manufacturing firms were set up prior to 1929, while by the late 1950s only three of these firms were left (Thurow, 2003: 56).

DATA AND METHOD

Data on entrepreneurship and economic development

We make use of the Global Entrepreneurship Monitor (GEM) and some other sources. In 2002 there were 37 countries participating in GEM (see the Appendix). Of these, one country (Croatia) has not been included in the regression analysis due to missing data for the independent variables. The GEM database includes various metrics of entrepreneurship[5], as well as a wide selection of explanatory variables from standardized national statistics[6].

Our dependent variable is gross inflow into entrepreneurship. There are several reasons why we have chosen nascent entrepreneurship as its metric. Counts of new entries into business registries also reflect the creation of a new business unit, but these entries occur at the end of a successful start-up process and the proportion of still-born entrepreneurial efforts, in relation to those that reach the stage of registration, is unknown. Also, a major problem with a cross-national comparison of new registrations is its lack of harmonization, as these registrations are generally administrative files developed for other purposes often related to tax payments, while each country has developed different criteria for when a new business must pay a tax (related to unemployment insurance, social security payments, VAT etc.). Consequently, no database with harmonized business start-up data for a sufficient number of countries is available. Alternatively, we might have used GEM's so-called TEA-measures that include both nascent entrepreneurs and new businesses from 3-42 months old. TEA-rates have relatively smaller confidence intervals than nascent entrepreneurship rates. A conceptual disadvantage, however, is that TEA also reflects the survival rate of new enterprises. Thus we have chosen nascent entrepreneurship as our primary measure of entrepreneurship, but we have tested the stability of our findings through alternative regressions using TEA. Data on nascent entrepreneurship in 2002 are taken from the GEM 2002 Adult Population Survey. This database contains various entrepreneurial measures constructed on the basis of surveys of at least 2,000 respondents per country (37 countries in total). The nascent entrepreneurship rate is defined as the number of people actively involved

[5] These are nascent entrepreneurs, entrepreneurs in young businesses and entrepreneurs in established firms, as well as combinations thereof. See Reynolds, Bosma and Autio (2005).

[6] For some variables, missing data were collected from additional sources. For details, see Van Stel et al. (2004).

in starting a new venture, as a percentage of the adult population (18-64 years of age). For a further exposition, see the article on GEM's methodology in the present issue (Reynolds, Bosma and Autio, 2005). The nascent entrepreneurship rate (per 100 adults) in 2002 ranges from 11.6 in Thailand and 10.9 in India, to values below two in Russia, Sweden, Japan and Taiwan.

The most important manifestation of economic development is increasing per capita income. Gross national income per capita 2001 is expressed in purchasing power parities per US$, and these data are taken from the 2002 World Development Indicators database of the World Bank. As argued before, an alternative indicator of economic development is innovative capacity. We use the GCR Innovation Capacity Index taken from chapter 2.2 of the Global Competitiveness Report 2001-2002 of the World Economic Forum (Porter and Stern, 2002) [7]. It describes national innovative capacity as a country's potential to produce a stream of commercially relevant innovations. This capacity is not simply the realized level of innovation but also reflects the fundamental conditions, investments, and policy choices that create the environment for innovation in a particular location or nation. The index combines four sub-indexes, all of which capture a different aspect of innovative capacity. Each sub-index measures *the relative contribution* to the number of US patents in the period 1999-2000 (an indicator for a country's actual level of innovation), based on regressions using data from the GCR Survey. The four sub-indexes are the proportion of scientists and engineers in the workforce, which is an indicator for a country's innovation infrastructure; the innovation policy sub-index, captured by, among other things, intellectual property protection and R&D tax credits for the private sector; the cluster innovation environment sub-index, captured by, among other things, the pressure from domestic buyers to innovate and the presence of suppliers of specialized research and training; and the linkages (between innovation infrastructure and a nation's industrial clusters) sub-index, captured by the quality of scientific research institutions and the availability of venture capital.

Method of analysis

[7] The value for Hong Kong is missing from the GCR. However, three of the four sub-index values for Hong Kong *are* given, and based on that we approximate the Innovative Capacity Index for Hong Kong to be 22.8.

We carry out three series of regressions for testing the hypothesized relationship between a country's gross inflow into entrepreneurship and its level of economic development. First, we regress nascent entrepreneurship on economic development as measured by per capita income, testing various functional relationships. Second, we carry out similar regressions using the innovative capacity index as our metric of economic development. Third, we repeat our regressions while adding several control variables. In the first approach, we look at different functional forms of the relationship between nascent entrepreneurship and per capita income. We consider three specifications: a linear relation, a quadratic specification (U-shape), and an inverse specification, i.e. decreasing towards an asymptote (L-shape). We look at the statistical fit of these three specifications (adjusted R^2 values). We also investigate whether there is a statistically superior specification, by applying likelihood ratio tests. In the second approach we again test these functional forms of nascent entrepreneurship but this time using the innovative capacity index as our metric of the level of economic development. In the third approach, we test our hypothesis against a selected set of control variables. First, we select an 'optimal' set of control variables from a larger portfolio, basically using a general-to-specific modeling procedure and successively eliminating the independent variable with the smallest t-statistic and re-estimating until each variable is significant at 10% level[8]. Next, we estimate a full model including a U-shaped relationship with either metric of economic development and the chosen set of control variables.

CONTROL VARIABLES

In addition to the level of economic development, many other economic, technological, demographic, cultural and institutional variables determine the rate of (nascent) entrepreneurship. There is an extensive literature on these influences, across wide-ranging scientific domains including neo-classical economics, institutional economics, sociology and anthropology. Recently, these influences have been integrated into an eclectic framework (Verheul et al., 2002; Wennekers et al., 2002). This framework is necessarily multidisciplinary in nature and distinguishes between various economic and non-economic domains. From this framework, we have selected a portfolio of independent variables as controls for testing our hypothesis.

[8] This method follows Bleany and Nishiyama (2002).

Other economic factors

In addition to the level of per capita income, other economic factors also may impact nascent entrepreneurship. First, *economic growth in 2001 and in 2002* are defined as the annual % GDP growth in constant prices (i.e. real growth) for these respective years, and are taken from the World Economic Outlook 2002 of the International Monetary Fund (IMF). Increased demand for goods and services is a major factor stimulating new business start-ups, as may be inferred from various country studies of regional variations in new firm formation (Reynolds, Storey and Westhead, 1994: 449). In the short run business cycle fluctuations influence the market opportunities for new entrepreneurs, as was born out by recent evidence (Reynolds et al., 2002). We expect a positive influence of the annual economic growth rate on nascent entrepreneurship. Secondly, *unemployment* may act as a push factor for self-employment, but it may also be a negative (inverse) indicator of entrepreneurial opportunity (Evans and Leighton, 1990; Audretsch and Thurik, 2000; Verheul et al., 2002). We use the 2001 unemployment rate, taken from Table 1.4.06 of the World Competitiveness Yearbook 2002 of the Institute for Management Development. Third, *income disparity* may stimulate entrepreneurship. On the supply side it may be both a push and a pull factor to enter self-employment, and on the demand side it is likely to create a more differentiated demand for goods and services. Empirical research by Ilmakunnas et al. (1999) suggests that income inequality positively influences the rate of self-employment, although reversed causality cannot be ruled out. Unfortunately, data on income disparity were not available for all 36 countries in our sample, so we discarded this variable.

Other technology indicators

The role of technology in general has been discussed above with respect to the influence of a nation's innovative capacity on entrepreneurial activity. Other specific technology indicators include the availability of computers and the use of Internet. These two variables are defined as the number of computers respectively Internet subscribers per 1000 people (in 2001), and are taken from Tables 4.2.09 and 4.2.10 of the World Competitiveness Yearbook 2002.

Demographic variables

Relevant demographic factors include population growth, age distribution and educational attainment. *Population growth* is expected to have a positive effect on entrepreneurship (Armington and Acs, 2002: 43). A growing population provides opportunities for new economic activity as new and bigger consumer markets emerge because of the growing population (demand side of entrepreneurship). Population growth may also be a push factor to engage in new economic activity in order to make a living, particularly when population growth is driven by immigration (supply side of entrepreneurship). The population growth 1996-2002 is taken from the US Census Bureau IDB (International Data Base). As regards *age distribution,* while start-ups occur in all relevant age groups, the prevalence rate of nascent entrepreneurship is often seen to be highest in the age group between 25 and 34 (Delmar and Davidsson, 2000; Verheul et al., 2002). Regarding the age composition of the population in 2002, we have shares in total population of five age groups: 20-24, 25-34; 35-44; 45-54 and 55-64 years. These data are also taken from the International Data Base of the US Bureau of the Census. *Education* is somewhat of an anomaly (Wennekers et al., 2002). Research conducted on a Swedish sample at the individual level shows that nascent entrepreneurs have, on average, attained a higher educational level than those in a control sample (Delmar and Davidsson, 2000). Lee, Florida and Acs (2004) present evidence that post-secondary education may have a positive effect on new firm formation in services, but a negative effect in manufacturing. However, educational attainment could not be included in our study as data are not available for all countries in our sample.

Culture

A relevant phenomenon in the cultural domain is the influence of *entrepreneurial role models*, as represented by the prevalence of incumbent business owners, on nascent entrepreneurship (Wennekers, 2005) [9]. The incumbent business ownership rate is computed as the sum of entrepreneurs in 'young businesses' and 'established businesses', both measured as a percentage of adult population (18-64 years old), taken from the GEM 2002 Adult Population Survey[10]. An enterprise is defined as a 'young business' if the business has

[9] A special case, empirically confirmed by de Wit (1993), is the hypothesis that children of self-employed fathers (parents) are more likely to become self-employed themselves.

[10] This variable is not to be confused with the so-called 'Total Entrepreneurial Activity' (TEA) used elsewhere in this paper, which combines the nascent entrepreneurs and the 'new businesses'.

paid salaries and wages for more than three months but for less than 42 months, and as an 'established business' if the business has paid salaries and wages for more than 42 months (Reynolds et al., 2002, p. 38). Secondly, *a (former) centralized command economies' dummy* is included because over many decades of the 20th century, culture and institutions in the (formerly) communist countries have become unfavorable or even hostile to self-employment. We control for this negative impact on entrepreneurship by introducing a dummy. The variable has value 1 for Russia, Hungary, Poland, China and Slovenia, and value 0 for all other countries in our sample.

Institutions

Relevant institutions include fiscal legislation (tax rates and tax breaks), the social security system influencing the rewards and the risks of entrepreneurship, and the administrative requirements for starting a new business. The impact of *taxes* on the level of entrepreneurial activity is complex and even paradoxical (Verheul et al., 2002). On the one hand high tax rates reduce the return on entrepreneurship, on the other hand self-employment may offer greater opportunities to evade or avoid tax liabilities. For a selection of 12 OECD countries spanning the period 1972-1996, Parker and Robson (2004) find a significantly positive effect of personal income tax rates on self-employment. Our control variable is tax revenues as % of GDP (1999), taken from Table 2.2.09 of the World Competitiveness Yearbook 2001. The effect of *social security* on entrepreneurial activity may also be two-sided. First, there is a negative impact in so far as generous social security for employees increases the opportunity costs of entrepreneurship. In this respect, social security benefits determining the opportunity costs of unemployed persons may also interact with unemployment (Noorderhaven et al. 2004). Second, social security in general may have a positive effect on entrepreneurial activity by creating a safety net in the case of business failure. Social security cost as a percentage of GDP (2000), taken from Table 2.2.01 of the World Competitiveness Yearbook 2001, is used as our control variable. The *administrative requirements for starting a new business* are measured as the number of permits and the number of days required to start a new business taken from Tables 8.05 and 8.06, respectively, of the Global Competitiveness Report 2001-2002. These variables are expected to have a negative bearing on business start-ups.

A correlation matrix for the dependent and independent variables is presented in Table 1. The table is based on 36 observations, i.e., excluding Croatia that has missing values for several variables (also see the Appendix). Because the 'age group variables' are highly inter-correlated, only the population share of age group 45-54 years, which is most strongly (negatively) correlated with nascent entrepreneurship, is included in the table.

TABLE 1 ABOUT HERE

ANALYSIS OF THE MAIN RESULTS

Approach 1 – Per capita income and nascent entrepreneurship

We computed regressions for the linear, quadratic and inverse specifications, as described in the 'Data and Method' section, using data for 36 countries participating in GEM 2002 (Croatia excluded). Based on a comparison of adjusted R^2 values and nested likelihood ratio tests we conclude that the linearly decreasing specification is formally rejected, compared to the quadratic (U-shaped) and inverse (L-shaped) specifications (see Annex II in Van Stel et al., 2004, for details). Additional likelihood ratio tests reveal that the statistical fit of the quadratic specification (U-curve) is somewhat better than that of the inverse specification (L-curve), but this difference is not significant. So most probably, from a certain level of economic development onwards, entrepreneurship starts to rise again as per capita income increases still further. Estimation results for the quadratic specification are in the left column of Table 2. As an illustration, in Figure 1 we depict the estimated U-curve as well as the positions of the 37 GEM countries (including Croatia) in the per capita income/nascent entrepreneurship space (country two letter codes are in the Appendix). The minimum of the curve lies at about 22,000 US $, at the level of 3.3 nascent entrepreneurs per 100 adults. As a test of robustness we also carried out a regression excluding the uppermost observation on the right-hand side (the US). Both the linear and the quadratic per capita income terms remain significant at 5% level. A further test of the robustness of our results is provided by alternative regressions of TEA, the total entrepreneurial activity index that includes nascent entrepreneurs as well as owner-managers of young businesses. Applying likelihood ratio tests

similar to those applied for nascent entrepreneurship, the quadratic specification performs best.[11]

TABLE 2 ABOUT HERE

FIGURE 1 ABOUT HERE

Approach 2 – Innovation capacity and nascent entrepreneurship

To test the role of the innovative capacity as a metric of economic development we perform a similar exercise as in approach 1. Again we test linear, quadratic and inverse specifications, based on the innovative capacity index. We find again that the linear specification is rejected. This time however, the inverse specification is also formally rejected, in favor of the quadratic specification. This suggests that initially, a developing innovation system discourages new and small enterprises ('regime of creative accumulation') up to a certain point onwards, after which still further improvement of the innovation system favors entrepreneurship ('regime of creative destruction').[12] Estimation results are in the right column of Table 2, while Figure 2 presents the estimated U-curve. The minimum of the curve of 3.3 nascent entrepreneurs per 100 adults is reached at a level of the innovative capacity index of 25.5. For comparison, the index values for the 36 countries in our data set range from 16.8 (Mexico) to 30.3 (US), and 14 countries have a value higher than 25.5 (source: Porter and Stern, 2002, p. 104). Compared to per capita income, the U-shaped relation with innovative capacity is somewhat less robust to removal of the US observation. The t-value of the squared term then drops to 1.7. As in the case of approach 1 (per capita income), regression results for TEA are similar to those for nascent entrepreneurship.[13]

FIGURE 2 ABOUT HERE

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[11] Adjusted R^2 is 0.32. T-values for linear and quadratic term are –3.3 and 2.6, respectively.

[12] The relation between innovation and entrepreneurship is a complex one. We assume an "innovation pull" effect: if innovation is in the air because of the specific stage of the technology cycle there will be a supply of entrepreneurial energy trying to exploit the opportunities. The reverse effect is also likely to exist when the supply of entrepreneurship, driven for instance by low opportunity costs, leads to the exploration of new markets because incumbent markets have high entry barriers. In reality, these two effects will probably interact leading to dynamic spurts in innovative and entrepreneurial behavior. Further research using times series data sets is needed to throw more light on the exact relationship between innovative and entrepreneurial behavior.

[13] Quadratic specification has highest adjusted R^2, 0.34. T-values for linear and quadratic term are –2.4 and 2.1, respectively.

Approach 3 – Regression analysis including control variables

In the third approach we test the role of economic development against the influence of our control variables as other possible determinants of nascent entrepreneurship. To reduce multicollinearity, we omit Internet penetration per capita, the number of days required to start a business, and economic growth in 2002 from the control variables[14]. Next, we apply a general-to-specific modeling procedure, resulting in a set of significant variables. However, some candidate control variables may not appear in the final set because of multicollinearity with other regressors, and may be re-assessed.

TABLE 3 ABOUT HERE

Estimation results for this approach, employing linear relationships only, are in Table 3. The first column presents our initial set, i.e. a constant, ten control variables and linear terms of per capita income and innovative capacity. The final set of significant regressors (given our tolerance level of 0.1) is presented in the second column. However, it seems likely that the variables tax revenues and population growth were omitted from the procedure due to multicollinearity and not because they have no (significant) influence on nascent entrepreneurship (see Annex III in Van Stel et al., 2004, for details). Therefore, we also present results including these two variables (third column). In the last two columns of Table 3 we present our full model, combining the selected variables from the general-to-specific procedure (including tax revenues and population growth) with either the per capita income variables (linear and squared terms) or the innovative capacity index (linear and squared terms). As regards the estimated U-curves for per capita income and innovative capacity, we find these to be robust, because both terms (linear and squared) remain significant in the regressions including control variables[15]. In addition to the effects of per capita income and innovative capacity, we find significant effects of five variables. *First*, incumbent business ownership has a positive influence on nascent entrepreneurship. This supports the assumed importance of entrepreneurial role models. It may also reflect the willingness of experienced

[14] These variables are correlated with respectively the number of computers per capita, the number of permits required to start a business, and economic growth in 2001.

[15] However, the U-shaped curves of nascent entrepreneurship as estimated in Table 3 are somewhat less steeply sloped than those in Table 2. This may be due to the fact that the 'incumbent business ownership' variable is also U-shaped with respect to economic development, as discussed in the Literature Review section.

workers in small firms to go out and create a new business. An additional explanation is that a larger number of incumbent business owners may imply a higher turnover of enterprises, as discussed in the Literature Review section. *Second,* we find a negative effect of social security on nascent entrepreneurship. In countries with a relatively generous social security system, the unemployed have less financial need to set up shop for themselves. Besides, the opportunity costs of becoming self-employed are relatively high compared with wage-employment. Apparently, these effects dominate a potential positive effect stemming from a relatively high social minimum acting as a safety net in the case of business failure. *Third*, there is a negative effect for the (former) centralized command economies dummy. This reflects that the 'inherited' culture and institutions in the (former) communist countries are less suitable for self-employment. *Fourth*, tax revenues as a percentage of GDP are found to have a positive effect on nascent entrepreneurship. This result supports the tax evasion or tax avoidance hypothesis, but it may also reflect that countries with higher tax revenues may be spending more on infrastructure and research and development, providing a better context for new start-ups. *Fifth*, we find the hypothesized positive effect of population growth. This confirms earlier results presented by Hunt and Levie (2003) who use individual GEM-data within the context of a different model specification.[16]

Differentiating between opportunity-based and necessity-based nascent entrepreneurship

In this section we distinguish between opportunity-based and necessity-based entrepreneurial activity. We estimate equations for these types of nascent entrepreneurship, comparing different functional forms of our metrics of economic development. The Global Entrepreneurship Monitor distinguishes two basic (classes of) dominant reasons or motives why individuals participate in entrepreneurial activities: (a) primarily, they perceive a business opportunity (i.e. they choose to start a business as one of several possible career options), or (b) they see entrepreneurship as their last resort (i.e. they feel compelled to start their own business because all other work options are either nonexistent or unsatisfactory). Using this categorization it is possible to label more than 97 percent of those who are active as either "opportunity" or "necessity" entrepreneurs (Reynolds et al., 2002, p. 15). In our

[16] Using the method of Hierarchical Linear Modelling, Hunt and Levie (2003) link various entrepreneurship measures at the individual level (94,260 respondents) to a number of explanatory variables at the macro level, and find that "population growth was the only consistent predictor of entrepreneurial activity, being significant

sample, the mean share of opportunity nascent entrepreneurship with respect to total nascent entrepreneurship is 79%. In Norway this share is as high as 99%. Relatively low shares (below 60%) are found in South Africa, Argentina, Brazil and Chile. In other words, in these (lesser developed) countries relatively many nascent entrepreneurs engage in entrepreneurial activity out of necessity.

We compare linear, U-shaped and L-shaped relations for opportunity and necessity nascent entrepreneurship separately, by again applying likelihood ratio tests. Some results are presented in Table 4. With respect to *per capita income*, we find a quadratic (U-shaped) relationship to have the best statistical fit for opportunity entrepreneurship. This finding is intuitively plausible in so far as many new opportunities for entrepreneurship arise at the high end of economic development. For necessity entrepreneurship we find a negative relationship with per capita income, which is also plausible. As regards *innovative capacity*, we again find a quadratic function for opportunity entrepreneurship and a decreasing function for necessity entrepreneurship. However, this function is L-shaped instead of decreasing linearly.

TABLE 4 ABOUT HERE

CONCLUSIONS

In this paper, a U-shaped relationship between the rate of nascent entrepreneurship and the level of economic development is hypothesized based on both the literature on entrepreneurship and that on economic development. This hypothesis is tested using three approaches of the explanation of nascent entrepreneurship across countries and using data for 36 countries participating in the Global Entrepreneurship Monitor 2002. The *first* approach finds support for a U-shaped relationship between nascent entrepreneurship and per capita income as our metric of economic development. The *second* approach finds support for a U-shaped relationship between nascent entrepreneurship and an innovative capacity index. The *third* approach tests these U-shaped relationships against several control variables, including the incumbent business ownership rate (+), social security expenditure (-), tax revenues (+), population growth (+), and a (former) communist country dummy (-). A specification

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and positive for all measures of entrepreneurial activity except corporate start-ups and informal investment".

combining either of the two approaches for economic development with the control variables corroborates our hypothesized U-shaped relationship between nascent entrepreneurship and economic development. The model using the innovative capacity index as our metric of economic development has the highest explanatory power (adjusted R^2 =0.75). Additionally, separate regressions for opportunity-based nascent entrepreneurship (U-shaped relationship) and necessity-based nascent entrepreneurship (decreasing relationship) underline that the U-shaped relationship between total nascent entrepreneurship and economic development is particularly related to the creation of many new business opportunities at more advanced levels of economic development. We assume that the U-shaped patterns for total nascent entrepreneurship, as shown in Figures 1 and 2, are the net effect of two processes affecting opportunity and necessity entrepreneurship[17].

The results suggest that a 'natural rate' of entrepreneurship is to some extent governed by 'laws' related to the level of economic development. Consequently, the level of economic development has to be taken into account to evaluate whether entrepreneurial dynamics are high or low. Furthermore, another study published in the present volume (Van Stel, Carree and Thurik, 2005) finds that the impact of entrepreneurial dynamics on economic growth is considerably smaller (or even negative) for developing countries than for more highly developed economies. Taken together, these results suggest that entrepreneurial dynamics play a different economic role in countries at different stages of economic development[18]. What does this conclusion imply for economic policy across subsequent stages of economic development? On the one hand, the results suggest that low-income nations, given their stage of development, should not consider the promotion of new business start-ups as a top priority on their policy agenda. Instead, they may be better off investing in the management qualities of their population and fostering the exploitation of scale economies through foreign direct investment and the growth of young businesses. To that purpose, governments of these countries must establish confidence in property rights, promote education, guarantee access

[17] In particular, adding up the estimated functions for necessity and opportunity entrepreneurship with respect to per capita income, rather closely reproduces the U-shaped curve estimated for total nascent entrepreneurship.

[18] For a similar conclusion with respect to the level of business ownership, see Carree et al. (2002) who estimate the 'equilibrium rate' of business ownership in 23 OECD countries to be a U-shaped function of economic development. Moreover, deviations between the actual and the equilibrium level of business ownership (given the stage of economic development) are found to have a negative impact on economic growth.

to capital markets, safeguard stable macro-economic conditions and make sure that the necessary physical infrastructure is in place. Moreover, they may consider providing specific tax incentives for foreign direct investment. On the other hand, for the economically most advanced nations, fostering investment in research and development, improving the incentives for self-employment, stimulating entrepreneurship education and promoting the commercial exploitation of scientific findings through transparent intellectual property rights and a well-developed market for venture capital offer the most promising approach for public policy.

Another conclusion has to do with the speed of adjustment towards the 'natural' rate of (nascent) entrepreneurship, or towards any other rate of entrepreneurship that a country might aspire. Next to the level of economic development, demographic, cultural and institutional factors are found to have an influence on the rate of entrepreneurial dynamics. As these determinants are structural in nature, their impact contributes to the stable and path-dependent character of comparative rates of nascent entrepreneurship[19]. Thus, in the short run the influence of government policy on the rate of entrepreneurial dynamics may be relatively modest. In the long run, government policy may have more impact through a gradual evolution of culture and institutions. Governments in high-income countries striving to promote entrepreneurship are advised to be patient and persevering. The road to an entrepreneurial society is a long one (Bosma et al., 2002).

Our study has several *limitations* that should be borne in mind when interpreting the results. *First*, the analysis pertains to the differences in nascent entrepreneurship across countries at one moment in time only. This is probably the main reason why no effect of cyclical variables was found. A preliminary analysis carried out by Reynolds et al. (2002), comparing so-called total entrepreneurship activity (TEA) rates for 29 countries in 2001 and 2002 however suggests the existence of a strong cyclical component of entrepreneurship (new business start-up rates) in the short run. However, the fact that the *relative rankings* of countries with respect to these TEA-rates are remarkably stable between these two years, supports the view that *structural* variables determine the comparative rate of

[19] With respect to the level of business ownership, Carree et al. (2002) also found a slow speed of adjustment.

entrepreneurship. *Second*, nascent entrepreneurship as used in our paper is an aggregate indicator of entrepreneurship. Disaggregating by sector may lead to different results. *Third*, the innovative capacity index as used in this paper is a broad concept. The use of the underlying sub-indices as described in the 'Data' section may throw more light on which aspects of innovative capacity are most important. This is important for concrete policy initiatives stimulating entrepreneurial activity. *Fourth*, by using the full set of GEM-countries in our regressions, the present paper implicitly assumes that the effects of the various independent variables are uniform across a wide variety of countries. However, there may be interaction effects in the sense that the level of economic development influences the effects of various other determinants. For instance, computers and Internet use may be more important for setting up a business in highly developed countries than in less developed ones. More generally, the model does not explicitly take into account that there may be multiplier effects, originating in a two-way relationship between entrepreneurship and economic development (Carree et al., 2002).

Table 1 Correlation matrix, 36 observations

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1. Nascent rate	1.00															
2. Business ownership	.63**	1.00														
3. GCR Innov. Cap. Index	-.55**	-.29	1.00													
4. Social security cost	-.45**	-.43**	.05	1.00												
5. Communist country	-.19	-.16	-.41*	.23	1.00											
6. Computers per capita	-.38*	-.16	.89**	-.09	-.43**	1.00										
7. Internet per capita	-.34*	-.08	.81**	-.18	-.42*	.96**	1.00									
8. Tax revenue	-.43**	-.35*	.54**	.38*	-.03	.56**	.45**	1.00								
9. Permits req. to start bus.	.25	.14	-.41*	.27	.06	-.41*	-.36*	-.12	1.00							
10. Days req. to start bus.	.24	-.05	-.45**	.31	.03	-.50**	-.50**	-.08	.78**	1.00						
11. Population growth 96-02	.39*	.18	-.10	-.42*	-.36*	.00	.02	-.59**	-.09	-.09	1.00					
12. Economic growth 2001	.09	.21	-.21	-.04	.45**	-.22	-.22	.04	.28	.03	-.31	1.00				
13. Economic growth 2002	-.03	.04	.06	-.18	.24	.02	.06	-.13	.20	-.02	.03	.67**	1.00			
14. Unempl. rate 2001	.03	-.20	-.31	.11	.08	-.48**	-.50**	-.03	.04	.27	-.11	-.12	-.32	1.00		
15. Population share 45-54 yr.	-.63**	-.39*	.52**	.28	.35*	.54**	.52**	.45**	-.44**	-.41*	-.36*	-.01	.07	-.32	1.00	
16. Per capita income	-.44**	-.29	.87**	.02	-.43**	.93**	.87**	.57**	-.38*	-.39*	-.08	-.24	-.11	-.41*	.56**	1.00

* p< .05 ** p< .01

Table 2 Relating nascent entrepreneurship (2002) to the level of economic development, as measured by per capita income and innovative capacity (approach 1 and 2)

	Approach 1: U-curved relationship with per capita income	Approach 2: U-curved relationship with innovative capacity
Constant	11.8 (6.6)	58.8 (3.8)
Per capita income	-.76 (3.4)	
Per capita income, squared	.017 (2.8)	
GCR Innovative Capacity Index		-4.3 (3.1)
GCR Inn. Cap. Index, squared		.085 (2.8)
Adjusted R^2	.31	.40
Observations	36	36

Absolute t-values between parentheses.

Table 3 Explaining nascent entrepreneurship in 2002, linear relations and full model (approach 3)

	General-to-specific procedure: starting linear regression	General-to-specific procedure: selected linear regression	Regressions including tax revenues and population growth	Full model combining U-shaped relationship with economic development and control variables	
Constant	13.0 (1.9)	14.7 (5.4)	13.3 (4.5)	7.5 (3.4)	51.1 (4.7)
Business ownership	.19 (2.2)	.17 (2.6)	.19 (2.9)	.18 (2.7)	.17 (3.0)
Social security cost as % GDP	-.046 (1.2)	-.044 (1.8)	-.043 (1.6)	-.029 (1.0)	-.047 (2.1)
Communist country	-1.6 (.8)	-2.6 (2.7)	-2.1 (2.0)	-1.8 (1.7)	-2.0 (2.2)
Computers per capita	-.002 (.4)				
Tax revenue as % GDP	.068 (1.2)		.060 (1.5)	.083 (1.9)	.081 (2.4)
Number of Permits required to start bus.	.038 (.2)				
Population growth 1996-2002	.15 (1.4)		.13 (1.6)	.19 (2.1)	.15 (2.0)
Economic growth 2001	.039 (.2)				
Population share 45-54 years old	-.14 (.4)				
Unemployment rate	-.029 (.3)				
Per capita income	.043 (.4)			-.71 (3.7)	
Per capita income, squared				.014 (2.9)	
GCR Innovative Capacity Index	-.43 (1.9)	-.45 (4.7)	-.51 (4.6)		-3.9 (4.1)
GCR Inn. Cap. Index, squared					.072 (3.6)
Adjusted R^2	.57	.63	.64	.62	.75
Observations	36	36	36	36	36

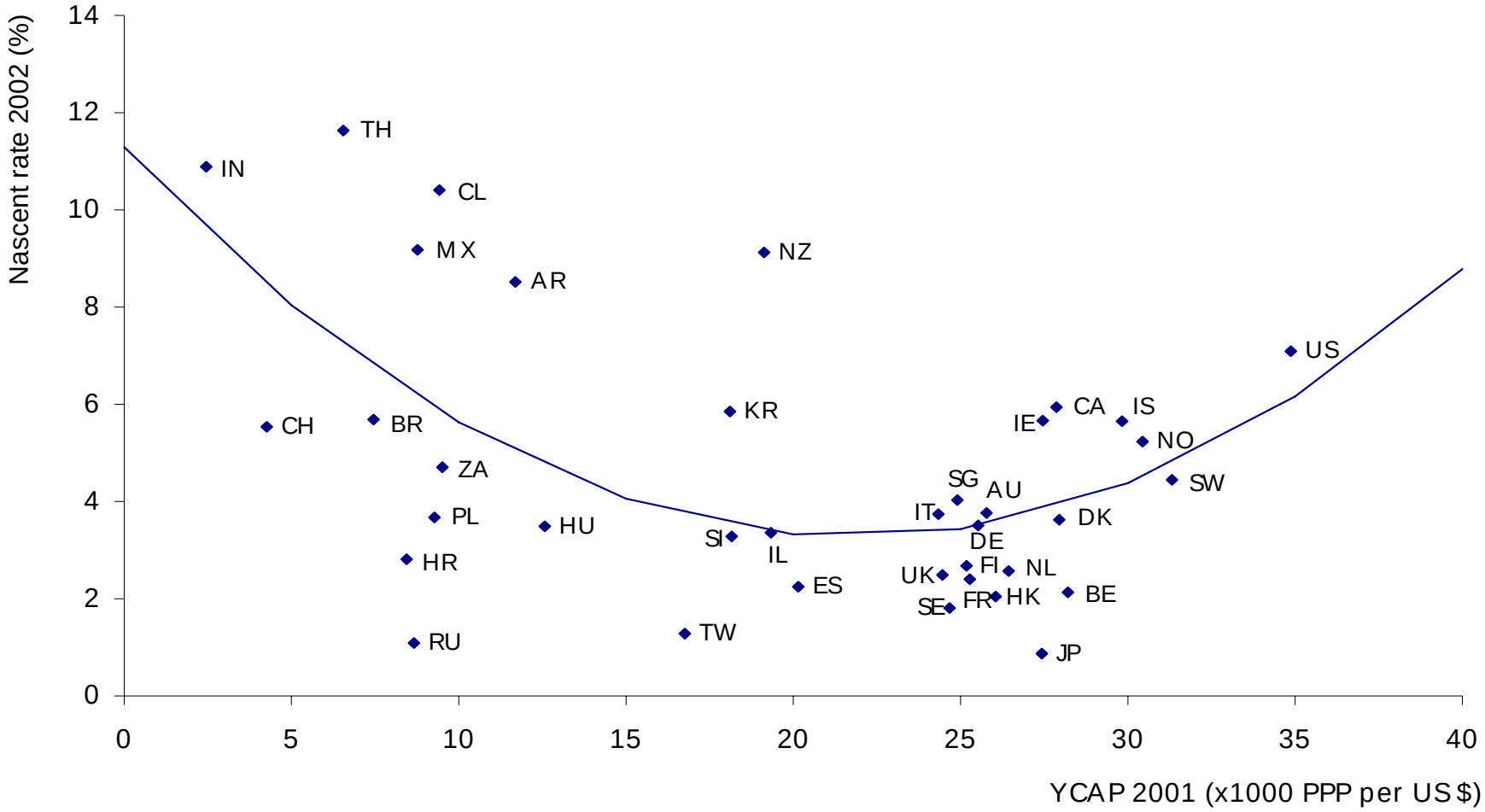
Absolute t-values between parentheses.

Table 4 Relating opportunity and necessity nascent entrepreneurship (2002) to the level of economic development, as measured by per capita income and innovative capacity:

	Per capita income		Innovative capacity	
	Opportunity	Necessity	Opportunity	Necessity
	Quadratic *	Linear *	Quadratic *	Inverse *
Constant	8.0 (5.6)	2.6 (7.7)	43.3 (3.3)	107.9 (5.8)
Linear term: x	-.57 (3.2)	-.079 (5.2)	-3.3 (2.9)	
Quadratic term: x^2	.014 (2.9)		.068 (2.7)	
Inverse term: x/(x+1)				-111.5 (5.7)
Adjusted R2	.20	.42	.24	.48
Observations	36	36	36	36

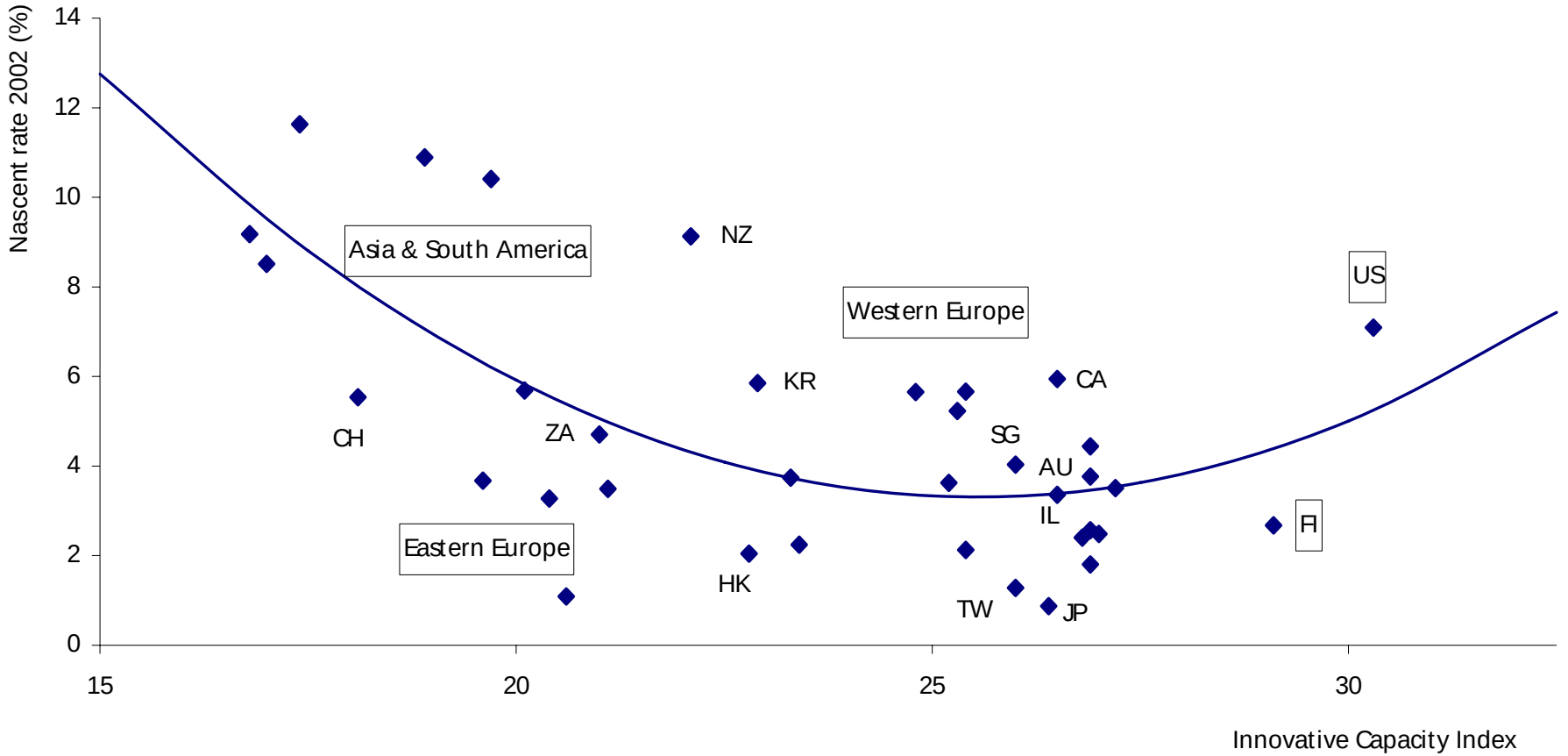
Absolute t-values between parentheses.
The symbol x stands for either per capita income of innovative capacity.
* Statistically superior specification.

Figure 1: Nascent entrepreneurship versus per capita income, the U-curve



For reasons of completeness Croatia (HR), that was not a part of the regression analysis, is also included in this figure.

Figure 2: Nascent entrepreneurship versus innovative capacity, the U-curve



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APPENDIX PARTICIPATING COUNTRIES IN GEM 2002

For the empirical part of the current paper we make use of the GEM database. The countries participating in GEM 2002 are listed below.

GEM participating countries (2002)

1. United States (US)
2. Russia (RU)
3. South Africa (ZA)
4. The Netherlands (NL)
5. Belgium (BE)
6. France (FR)
7. Spain (ES)
8. Hungary (HU)
9. Italy (IT)
10. Switzerland (SW)
11. United Kingdom (UK)
12. Denmark (DK)
13. Sweden (SE)
14. Norway (NO)
15. Poland (PL)
16. Germany (DE)
17. Mexico (MX)
18. Argentina (AR)
19. Brazil (BR)
20. Chile (CL)
21. Australia (AU)
22. New Zealand (NZ)
23. Singapore (SG)
24. Thailand (TH)
25. Japan (JP)
26. Korea (KR)
27. China (CH)
28. India (IN)
29. Canada (CA)
30. Ireland (IE)
31. Iceland (IS)
32. Finland (FI)
33. Croatia (HR) [1]
34. Slovenia (SI)
35. Hong Kong (HK)
36. Taiwan (TW)
37. Israel (IL)

[1] Croatia is not included in the regression analysis due to a lack of data for several independent variables.